

## **HYDROLOGY/HYDRAULICS STUDY**

### **Route 67 Self Storage Facility**

County of San Diego

LOG NO. 07-\_\_\_\_-\_\_\_\_

RO8-001, PO8-002, ER08-14-001

Dated: November 26, 2007

Prepared By:

***Snipes-Dye Associates***  
***civil engineers and land surveyors***

8348 Center Drive, Suite G  
La Mesa, CA 91942-2910  
619/697-9234, fax 619/460-2033

LK 0381

## **HYDROLOGY/DRAINAGE STUDY**

### **Route 67 Self Storage Facility**

County of San Diego

**LOG NO. 07-\_\_-\_\_**

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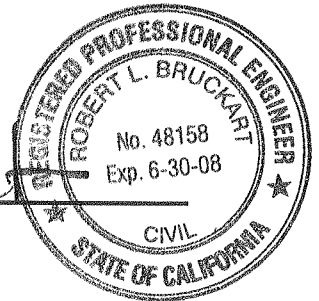
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Robert L. Bruckart, R.C.E. 48158



## **Preliminary Hydrology and Hydraulic Calculations for the Route 67 Self Storage Facility**

The project proposes the development of a self storage facility for personal and household items at 12410 Lakeside Avenue, Lakeside, California. The project consists of a three-story structure constructed into the sloping terrain with a perimeter access roadway surrounding the building. The 2.2 acre project site is located on the northerly side of Lakeside Avenue. The proposed building will include approximately 37,700 square feet of floor space. Development of the site will include the excavation and export of approximately 6,400 cubic yards of material. Street widening and improvement of the northerly side of Lakeside Avenue is proposed. The site is currently developed and utilized as residential housing. Some construction material storage and other construction activities are presently occurring on the site.

Site topography consists of a sloping pad located in the center of the property adjacent to Lakeside Avenue. The slopes along the easterly and westerly limits of the pad slope upward at an approximate fifty percent gradient. The existing pad slopes toward Lakeside Avenue at an eight percent gradient.

Offsite terrain directs drainage to the site from three basins. The major offsite basin located northerly of the site conveys sheet flow and concentrated flow to the northerly end of the development site. The hillsides located along the easterly and westerly sides of the site comprise the two other offsite drainage basins. Peak flow calculations for the two, ten, and one-hundred year storm events have been calculated for the current undeveloped condition. Those peak flows include drainage from the offsite basins.

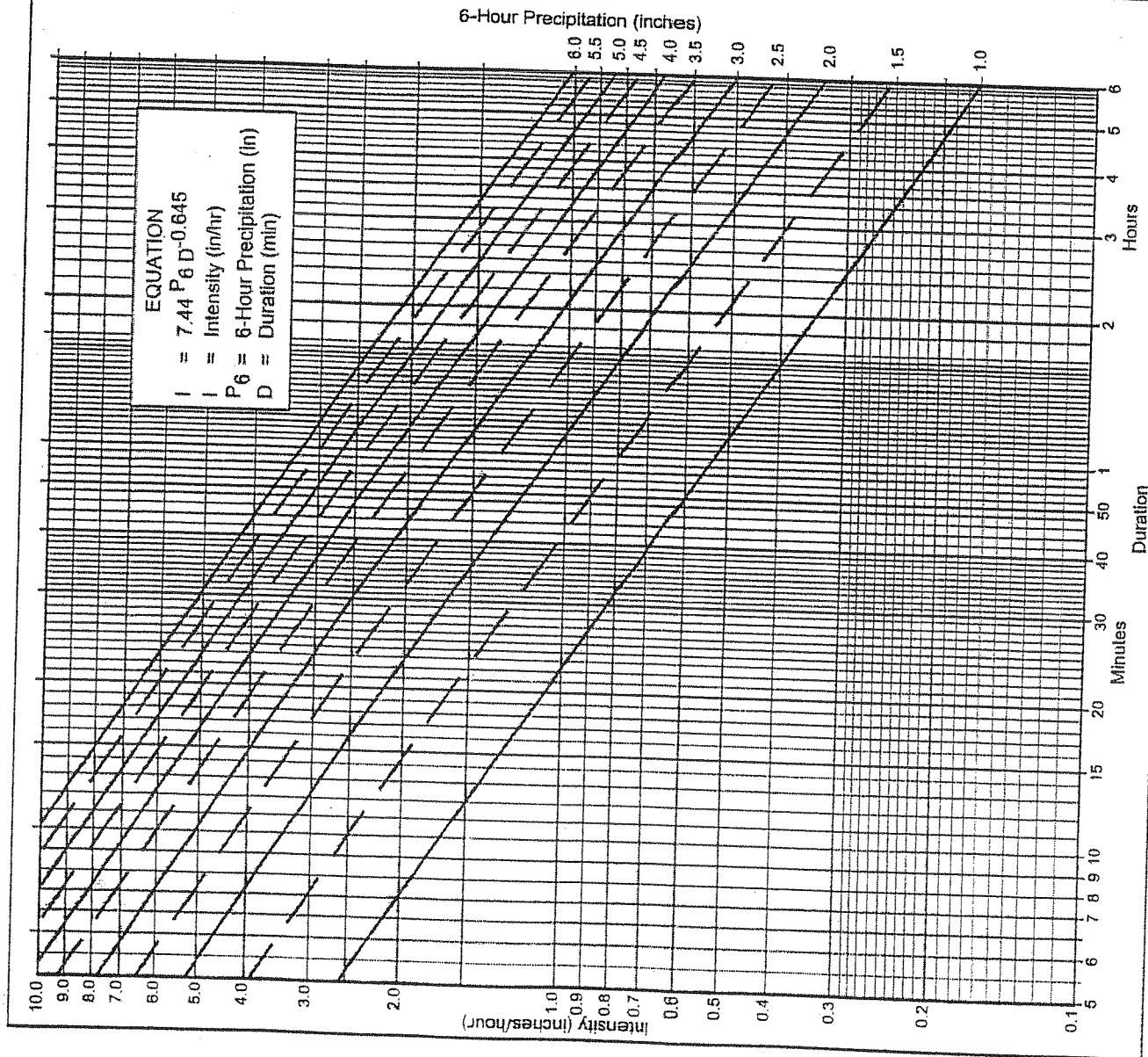
The development proposes collecting the drainage from the three offsite basins and conveying it through the development, offsite to the northerly limit of the San Diego River. Offsite and onsite drainage will be conveyed through surface swales and gutters, and subsurface storm drains. Peak flow calculations have been calculated for the proposed developed condition for the two, ten, and one-hundred year events. The peak flows include drainage from offsite basins.

A comparison of peak flows in the three calculated events is made considering basins of equal area. In the attached calculations for the developed condition, offsite basins along Lakeside Avenue have been included to assure adequate capacity of the proposed offsite discharge.

	BASIN AREA (ac)	STUDY NODE	PEAK FLOW (cfs)		
			2 Year	10 year	100 Year
Current	21.60	4	16.61	19.94	29.96
Developed	21.62	4	17.25	20.66	30.90

The development of the site will result in a minor increase in the peak stormwater discharge of approximately 3.5 percent. The calculated increase is within the accuracy of the calculations and considered insignificant. The development of the site with an increase of impervious surface would in itself increase the peak discharge. The leveling of portions of the site and lengthening of flow paths increase the time of concentration of the peak flow in the developed condition. The increased time of concentration equates to a lengthening of the discharge period and a reduction of the peak rate.

Attached hydrology and hydraulic calculations were prepared in accordance with the *San Diego County Hydrology Manual*, utilizing the San Diego County model of AES software. The rational method is the basis of the hydrology calculation.



### Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the Intensity-duration curve for the location being analyzed.

### Application Form:

(a) Selected frequency \_\_\_\_\_ year

(b)  $P_6 =$  \_\_\_\_\_ in.,  $P_{24} =$  \_\_\_\_\_,  $\frac{P_6}{P_{24}} =$  \_\_\_\_\_ %<sup>(2)</sup>

(c) Adjusted  $P_6^{(2)} =$  \_\_\_\_\_ in.

(d)  $t_x =$  \_\_\_\_\_ min.

(e)  $I =$  \_\_\_\_\_ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

$P_6$	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	1	1	1	1	1	1	1	1	1	1	1
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.69	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1

# County of San Diego Hydrology Manual



## Rainfall Isoplethials

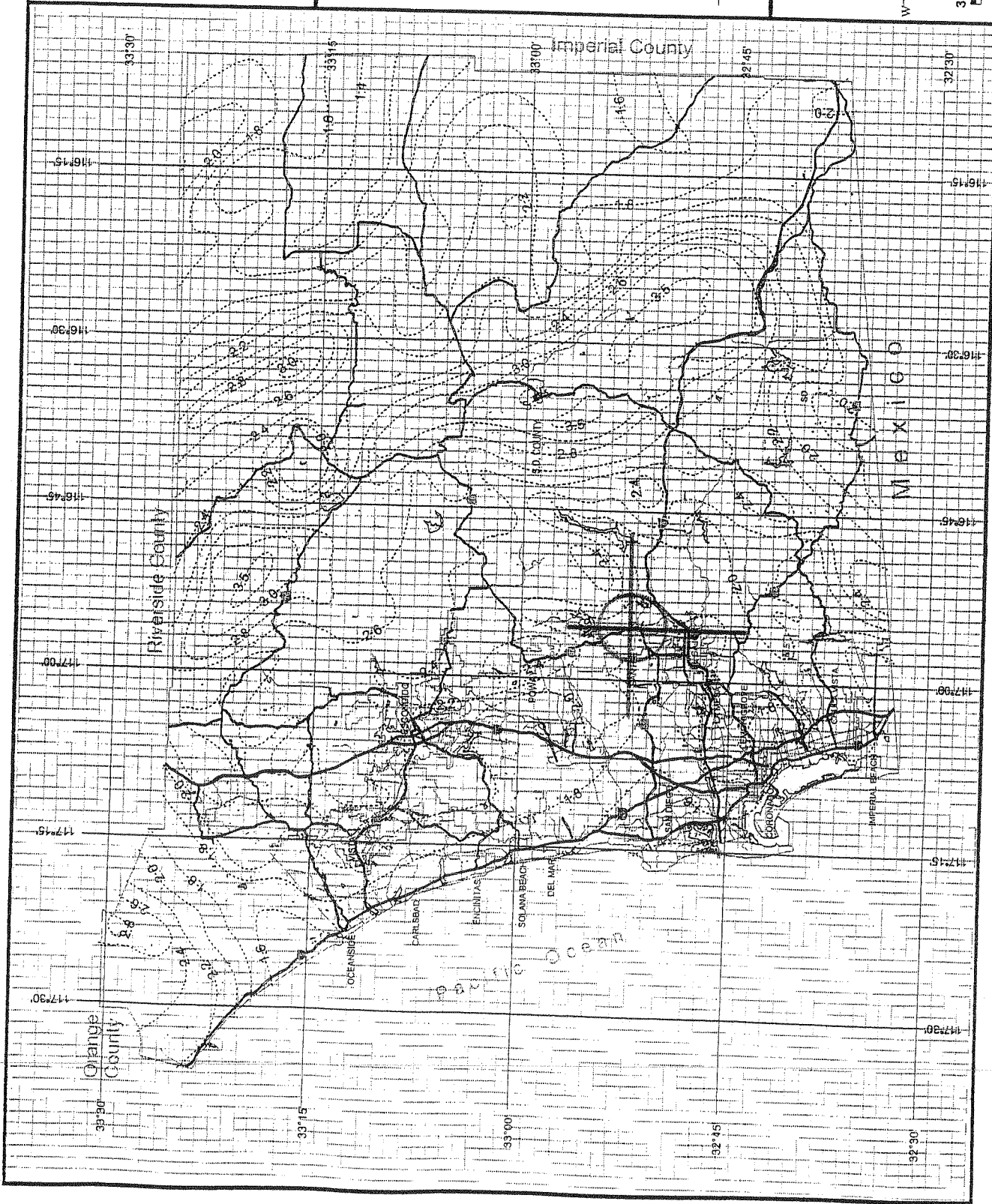
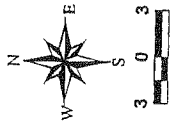
10 Year Rainfall Event - 6 Hours

.....  
Isoplethial (Inches)

1.8



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# County of San Diego Hydrology Manual

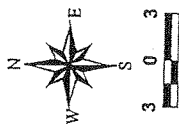
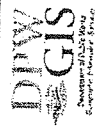


## Rainfall Isoplethals

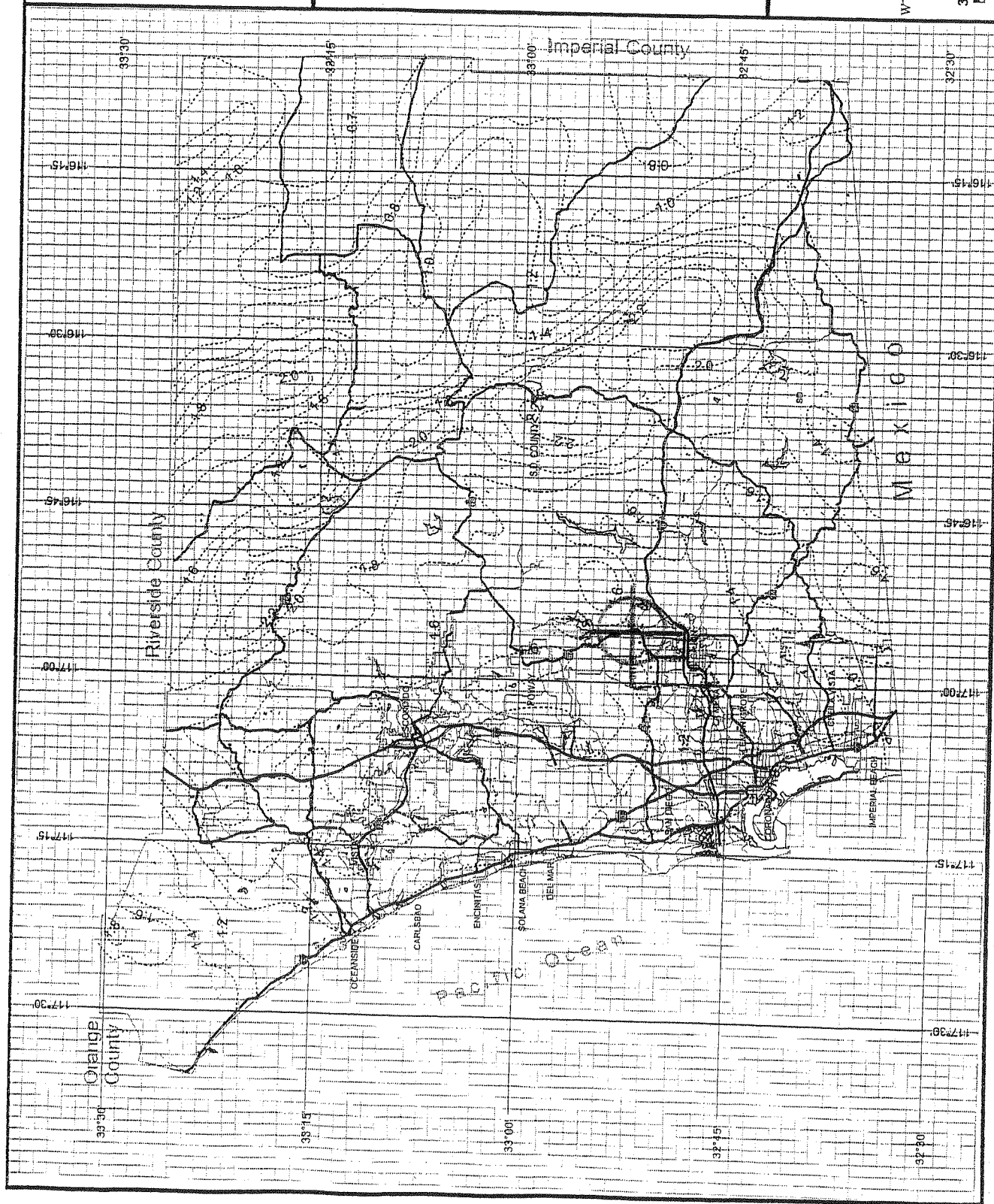
2 Year Rainfall Event - 6 Hours

..... Isopleth (inches)

1.5



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## Rainfall Isopluviols

### 100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

2.7

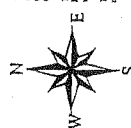
DAY  
 GIRLS  
 Department of Public Works  
 City of New York

**GIS**

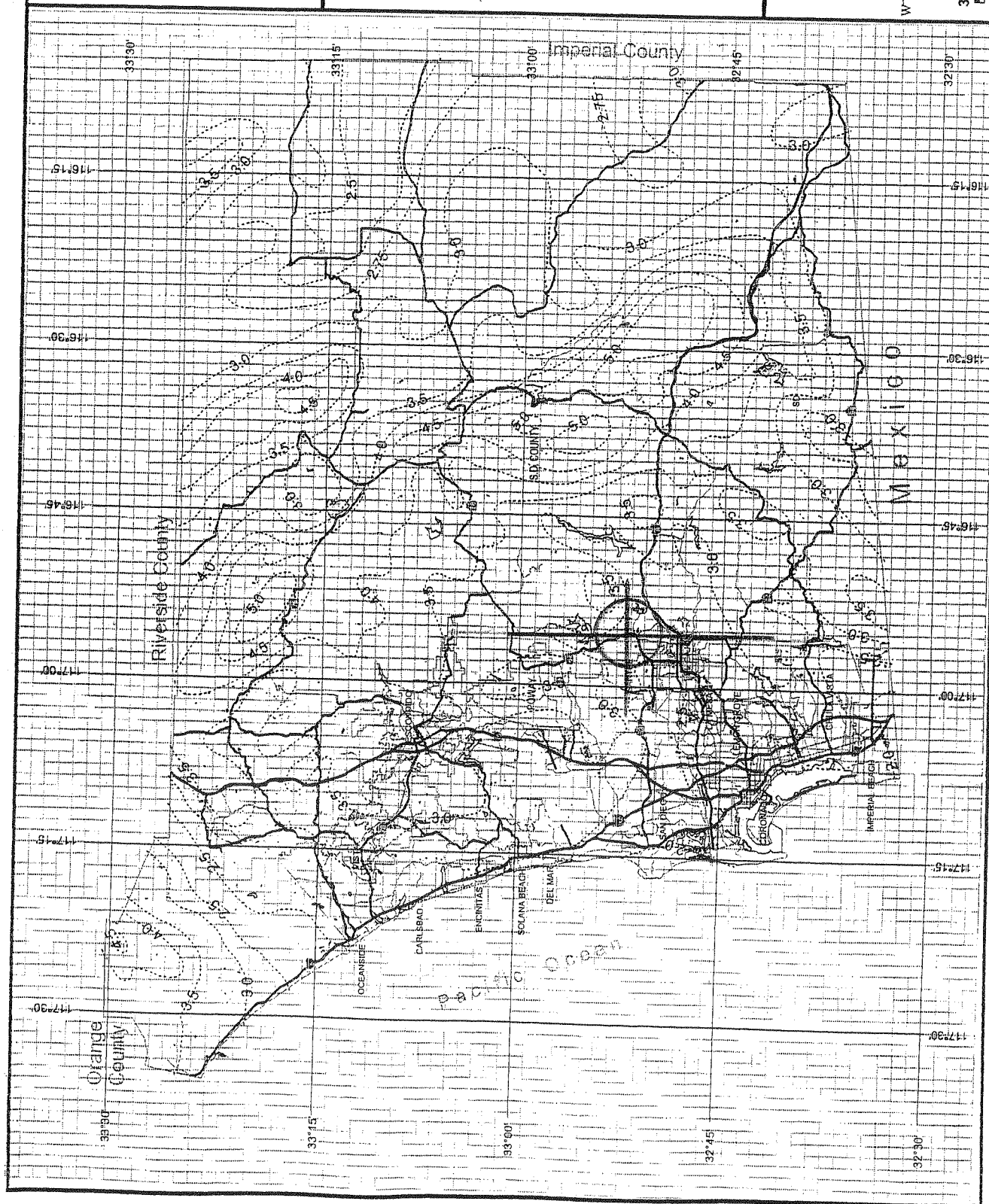
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by:

## 2 YEAR CURRENT CONDITION

-----  
FILE NAME: LK0381.DAT  
TIME/DATE OF STUDY: 15:11 11/14/2007  
-----

### USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

-----  
2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 2.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 1.500  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*  
FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21  
-----

### >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT	=	.4100
S.C.S. CURVE NUMBER (AMC II)	=	82
INITIAL SUBAREA FLOW-LENGTH(FEET)	=	100.00
UPSTREAM ELEVATION(FEET)	=	770.00
DOWNSTREAM ELEVATION(FEET)	=	735.00
ELEVATION DIFFERENCE(FEET)	=	35.00
SUBAREA OVERLAND TIME OF FLOW(MIN.)	=	5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!		
2 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.605
SUBAREA RUNOFF(CFS)	=	0.30
TOTAL AREA(ACRES)	=	0.20
TOTAL RUNOFF(CFS)	=	0.30

```

*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE = 53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 735.00 DOWNSTREAM(FEET) = 435.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00 CHANNEL SLOPE = 0.2222
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1707 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.30
FLOW VELOCITY(FEET/SEC) = 2.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 9.72 Tc(MIN.) = 15.49
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1450.00 FEET.
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.906
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 12.50
TOTAL AREA(ACRES) = 16.20 TOTAL RUNOFF(CFS) = 12.66
TC(MIN.) = 15.49
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE = 52
-----
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 435.00 DOWNSTREAM(FEET) = 406.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 200.00 CHANNEL SLOPE = 0.1450
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 12.66
FLOW VELOCITY(FEET/SEC) = 8.40 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 0.40 Tc(MIN.) = 15.89
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1650.00 FEET.
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.875
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) = 5.40 SUBAREA RUNOFF(CFS) = 4.15
TOTAL AREA(ACRES) = 21.60 TOTAL RUNOFF(CFS) = 16.61
TC(MIN.) = 15.89
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 21.60 TC(MIN.) = 15.89
PEAK FLOW RATE(CFS) = 16.61
=====

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
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Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by:

#### 10 YEAR CURRENT CONDITION

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FILE NAME: LK0381.DAT  
TIME/DATE OF STUDY: 15:36 11/14/2007  
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#### USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 10.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 1.800  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(Feet) = 100.00  
UPSTREAM ELEVATION(Feet) = 770.00  
DOWNSTREAM ELEVATION(Feet) = 735.00  
ELEVATION DIFFERENCE(Feet) = 35.00  
SUBAREA OVERLAND TIME OF FLOW(Min.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.326  
SUBAREA RUNOFF(CFS) = 0.35  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.35

```

*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =   53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    735.00  DOWNSTREAM(FEET) =    435.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1350.00  CHANNEL SLOPE =  0.2222
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1707 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =      0.35
FLOW VELOCITY(FEET/SEC) =    2.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =    9.72  Tc(MIN.) =   15.49
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  1450.00 FEET.
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.287
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =    82
AREA-AVERAGE RUNOFF COEFFICIENT =  0.4100
SUBAREA AREA(ACRES) =    16.00  SUBAREA RUNOFF(CFS) =    15.00
TOTAL AREA(ACRES) =    16.20  TOTAL RUNOFF(CFS) =    15.19
TC(MIN.) =    15.49
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =   52
-----
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    435.00  DOWNSTREAM(FEET) =    406.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    200.00  CHANNEL SLOPE =  0.1450
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =    15.19
FLOW VELOCITY(FEET/SEC) =    8.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =    0.38  Tc(MIN.) =   15.87
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  1650.00 FEET.
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.252
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =    82
AREA-AVERAGE RUNOFF COEFFICIENT =  0.4100
SUBAREA AREA(ACRES) =     5.40  SUBAREA RUNOFF(CFS) =     4.99
TOTAL AREA(ACRES) =    21.60  TOTAL RUNOFF(CFS) =    19.94
TC(MIN.) =    15.87
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    21.60  TC(MIN.) =    15.87
PEAK FLOW RATE(CFS)    =    19.94
=====

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Analysis prepared by:

100 YEAR CURRENT CONDITION

-----  
FILE NAME: LK0381.DAT  
TIME/DATE OF STUDY: 15:20 11/14/2007  
-----

-----  
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
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2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

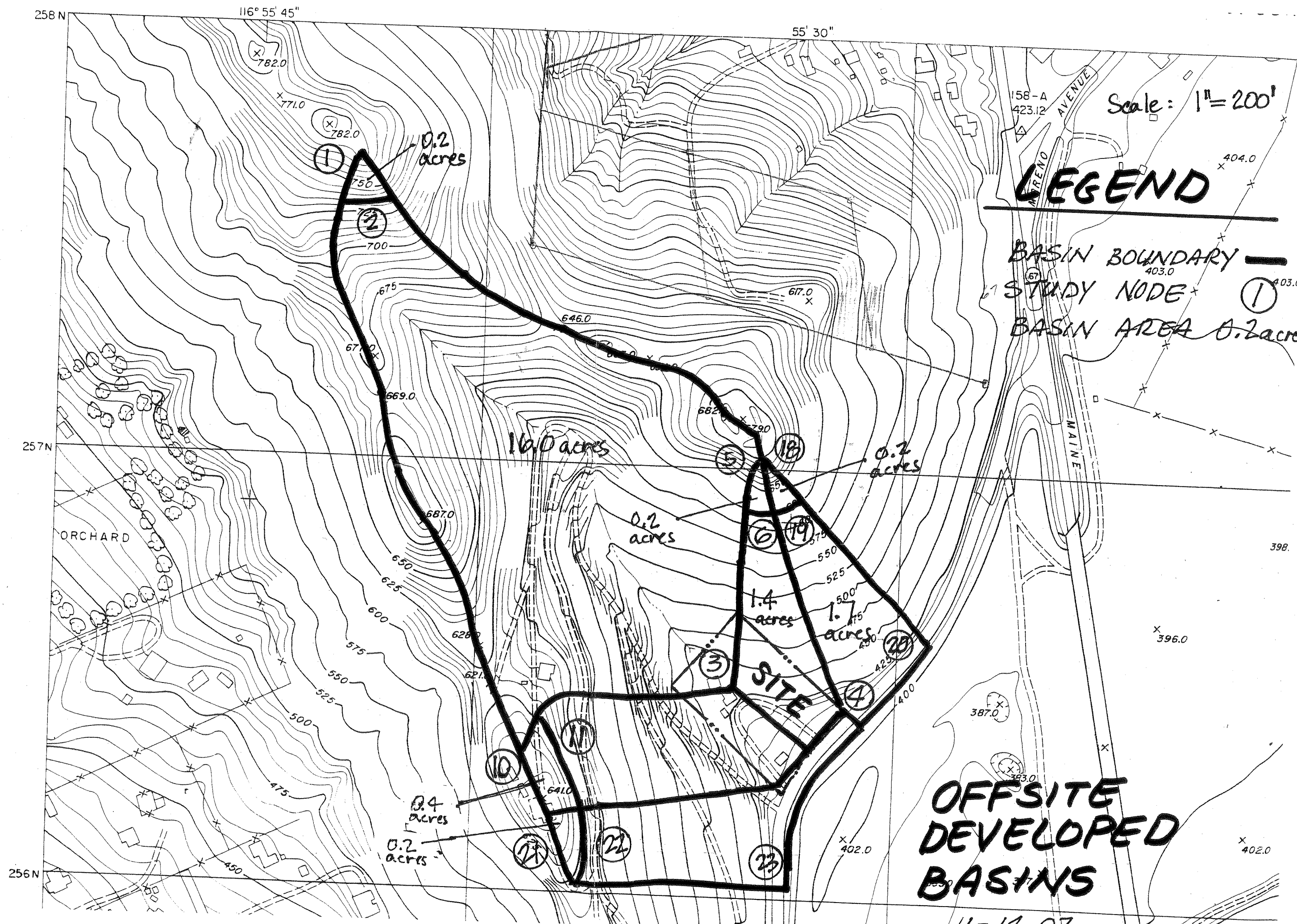
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USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 770.00  
DOWNSTREAM ELEVATION(FEET) = 735.00  
ELEVATION DIFFERENCE(FEET) = 35.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.489  
SUBAREA RUNOFF(CFS) = 0.53  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.53

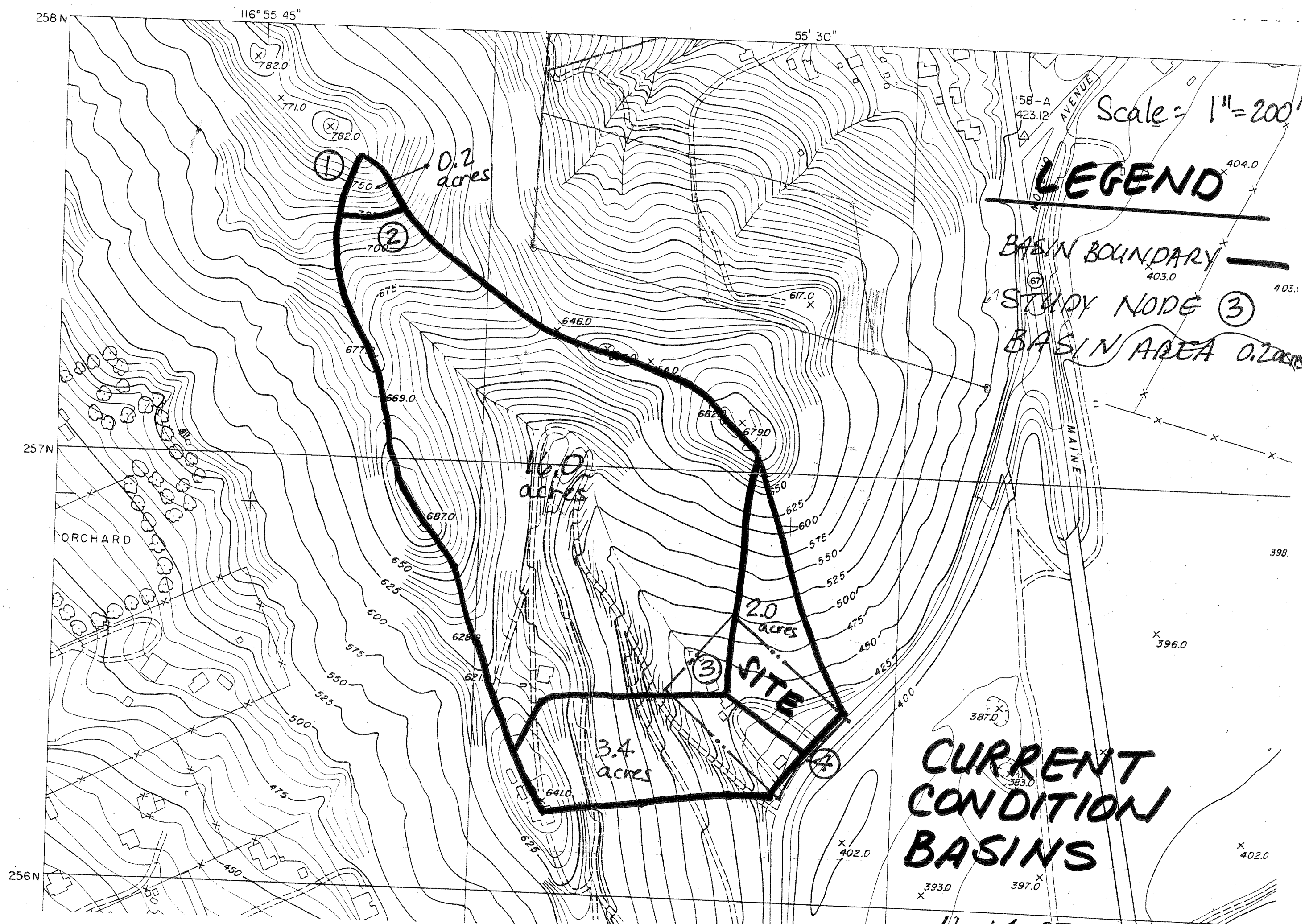
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*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE = 53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 735.00 DOWNSTREAM(FEET) = 435.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00 CHANNEL SLOPE = 0.2222
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1707 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.53
FLOW VELOCITY(FEET/SEC) = 2.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 9.72 Tc(MIN.) = 15.49
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1450.00 FEET.
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.431
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 22.50
TOTAL AREA(ACRES) = 16.20 TOTAL RUNOFF(CFS) = 22.79
TC(MIN.) = 15.49
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE = 52
-----
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 435.00 DOWNSTREAM(FEET) = 406.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 200.00 CHANNEL SLOPE = 0.1450
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 22.79
FLOW VELOCITY(FEET/SEC) = 9.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 0.34 Tc(MIN.) = 15.83
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1650.00 FEET.
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.383
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) = 5.40 SUBAREA RUNOFF(CFS) = 7.49
TOTAL AREA(ACRES) = 21.60 TOTAL RUNOFF(CFS) = 29.96
TC(MIN.) = 15.83
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 21.60 TC(MIN.) = 15.83
PEAK FLOW RATE(CFS) = 29.96
=====

```







# LEGEND :

ITEM	STD. DWG.	SYMBOL
EXISTING CONTOUR	---	400
PROPOSED CONTOUR	---	410
PROPOSED SPOT ELEVATION		409.25
EXISTING SPOT ELEVATION		405.6
BUILDING PERIMETER		
RETAINING WALL		
CONCRETE CURB		
CONCRETE CURB/ GUTTER		

ITEM	STD. DWG.	SYMBOL
PROPOSED CUT/FILL SLOPE (2:1 MAX)		
DIRECTION OF DRAINAGE (1:1 MIN)		
EDGE OF PAVEMENT		
CONCRETE PAVEMENT		
A.C. PAVEMENT		
TYPE F CATCH BASIN		
TYPE B CURB INLET		
TYPE A CLEANOUT		
PVC STORM DRAIN		

REVISION	BY

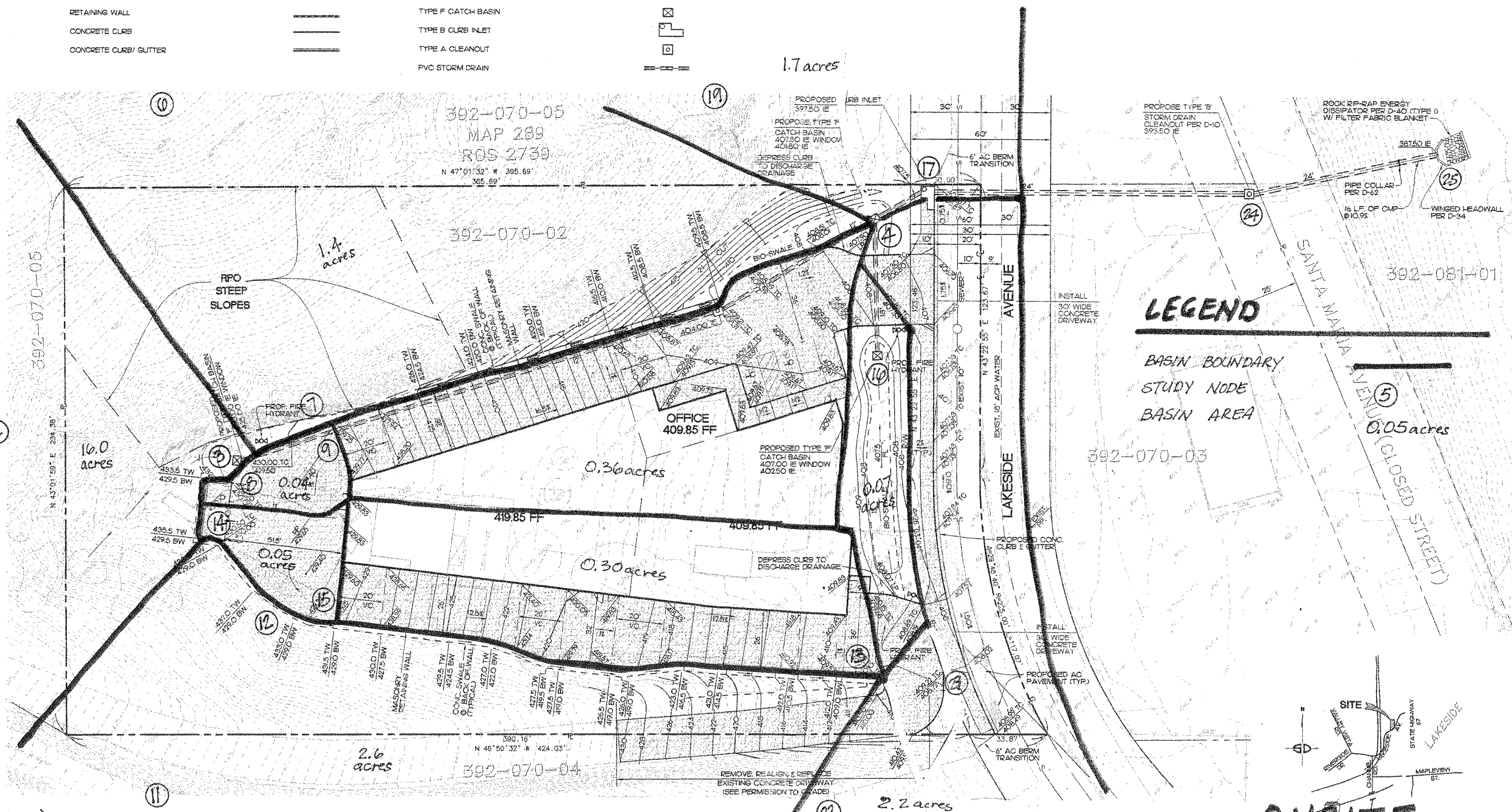
**RMI ARCHITECTS**  
 ARCHITECTURE • PLANNING • INTERIOR DESIGN  
 8330 UNIVERSITY AVENUE (619) 465-2011  
 LA MESA, CA 91941 FAX: (619) 465-2833  
 CONTACT: RICK MARRS (619) 465-2011 EXT 13  
 RICK@RMI-ARCHITECTS.COM

(858) 864-7741

**ROUTE 67 STORAGE**  
 CONTACT: MOE ROSENBERG  
 7770 REGENTS RD. # 113-192  
 SAN DIEGO, CA 92122-1967

PROJECT

DATE: 7-13-06  
 SCALE: 1"=20'  
 DRAWN: MH  
 JOB NO: LK0381  
 SHEET



## BENCH MARK :

COUNTY OF SAN DIEGO BENCHMARK EC 0207  
 BRASS DISC IN CONCRETE CURB, 0.4 MILES SOUTHWEST CORNER  
 OF INTERSECTION OF LAKESIDE DR. AND VISTA CAMINO.  
 ELEVATION = 387.151

## SITE ADDRESS :

12410 LAKESIDE AVENUE  
 LAKESIDE, CA 92040

## ASSESSOR PARCEL NUMBER :

392-070-02

## APPLICANT/OWNER :

DANLEE PROPERTIES  
 2055 THIRD AVENUE, SUITE C  
 SAN DIEGO, CA 92101

MOE ROSENBERG  
 7770 REGENTS RD. # 113-192  
 SAN DIEGO, CA 92122-1967  
 (658) 864-7741

## TOPOGRAPHY :

TOPOGRAPHY BY :  
 SAN-LO AERIAL SURVEYS  
 8/07

## EARTHWORK QUANTITIES

EXCAVATION :	6.350	C.Y.
EMBANKMENT :	0	C.Y.
EXPORT :	6.350	C.Y.

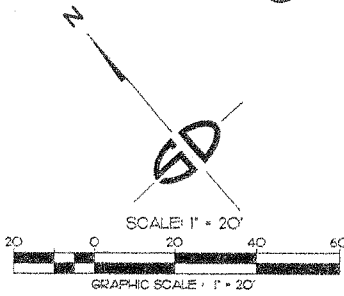
## ENGINEER OF WORK

**Snipes-Dye associates**  
 civil engineers and land surveyors  
 6348 CENTER DRIVE, STE. G, LA MESA, CA 91942  
 TELEPHONE (619) 697-4923 FAX (619) 490-2033  
 ROBERT L. BRUCKMAN R.C.E. 48158  
 EXPIRES 06-30-08

**ONSITE  
 DEVELOPED  
 BASINS**

**PRELIMINARY  
 GRADING PLAN**

11-14-07



\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by:

## 2 YEAR DEVELOPED CONDITION

-----  
FILE NAME: LK0382.DAT  
TIME/DATE OF STUDY: 14:39 11/14/2007  
-----

### USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

#### 2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 2.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 1.500  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

### >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 770.00  
DOWNSTREAM ELEVATION(FEET) = 735.00  
ELEVATION DIFFERENCE(FEET) = 35.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.605  
SUBAREA RUNOFF(CFS) = 0.30  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.30

```

*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE = 53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 735.00 DOWNSTREAM(FEET) = 430.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00 CHANNEL SLOPE = 0.2033
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1617 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.30
FLOW VELOCITY(FEET/SEC) = 2.25 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 11.10 Tc(MIN.) = 16.87
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1600.00 FEET.

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.804
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 11.83
TOTAL AREA(ACRES) = 16.20 TOTAL RUNOFF(CFS) = 11.98
TC(MIN.) = 16.87

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 425.00 DOWNSTREAM(FEET) = 401.80
FLOW LENGTH(FEET) = 295.00 MANNING'S N = 0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.25
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.98
PIPE TRAVEL TIME(MIN.) = 0.32 Tc(MIN.) = 17.19
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1895.00 FEET.

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.19
RAINFALL INTENSITY(INCH/HR) = 1.78
TOTAL STREAM AREA(ACRES) = 16.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.98

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```

*****
FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 675.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 50.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.605
SUBAREA RUNOFF(CFS) = 0.30
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.30
*****

FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE = 53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 430.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.5571
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.30
FLOW VELOCITY(FEET/SEC) = 2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 7.95
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 7.00 = 450.00 FEET.
*****

FLOW PROCESS FROM NODE      7.00 TO NODE      4.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 430.00 DOWNSTREAM(FEET) = 408.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 290.00 CHANNEL SLOPE = 0.0759
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.020 MAXIMUM DEPTH(FEET) = 1.50
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.737
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.08
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.44
AVERAGE FLOW DEPTH(FEET) = 0.32 TRAVEL TIME(MIN.) = 0.89
Tc(MIN.) = 8.84
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 1.57
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 1.80

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.38 FLOW VELOCITY(FEET/SEC.) = 6.26
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 4.00 = 740.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =   3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) =   8.84
RAINFALL INTENSITY(INCH/HR) =   2.74
TOTAL STREAM AREA(ACRES) =   1.60
PEAK FLOW RATE(CFS) AT CONFLUENCE =           1.80

*****
FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =   21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) =   65.00
UPSTREAM ELEVATION(FEET) =   430.00
DOWNSTREAM ELEVATION(FEET) =   429.00
ELEVATION DIFFERENCE(FEET) =   1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =   2.514
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =   3.952
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) =   0.14
TOTAL AREA(ACRES) =   0.04  TOTAL RUNOFF(CFS) =   0.14

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 4.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION(FEET) =	429.00	DOWNSTREAM ELEVATION(FEET) =	408.00
STREET LENGTH(FEET) =	230.00	CURB HEIGHT(INCHES) =	6.0
STREET HALFWIDTH(FEET) =	26.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 21.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.78  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.19  
HALFSTREET FLOOD WIDTH(FEET) = 3.17  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.57  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.68  
STREET FLOW TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 3.59  
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.952  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
\*USER SPECIFIED(SUBAREA):  
USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900  
SUBAREA AREA(ACRES) = 0.36 SUBAREA RUNOFF(CFS) = 1.28  
TOTAL AREA(ACRES) = 0.40 PEAK FLOW RATE(CFS) = 1.42

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.23 HALFSTREET FLOOD WIDTH(FEET) = 5.09  
FLOW VELOCITY(FEET/SEC.) = 3.77 DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.86  
LONGEST FLOWPATH FROM NODE 8.00 TO NODE 4.00 = 295.00 FEET.



```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS =   3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM   3 ARE:
TIME OF CONCENTRATION(MIN.) =   3.59
RAINFALL INTENSITY(INCH/HR) =   3.95
TOTAL STREAM AREA(ACRES) =   0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE =           1.42

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)    (INCH/ HOUR)    (ACRE)
    1         11.98      17.19         1.782         16.20
    2          1.80       8.84         2.737          1.60
    3          1.42       3.59         3.952          0.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR   3 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)    (INCH/ HOUR)
    1         4.65       3.59         3.952
    2         8.94       8.84         2.737
    3        13.79      17.19         1.782

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =   13.79   Tc(MIN.) =   17.19
TOTAL AREA(ACRES) =   18.20
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 = 1895.00 FEET.
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  10
-----
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====
*****
FLOW PROCESS FROM NODE      10.00 TO NODE      11.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH( FEET) = 100.00
UPSTREAM ELEVATION( FEET) = 641.00
DOWNSTREAM ELEVATION( FEET) = 625.00
ELEVATION DIFFERENCE( FEET) = 16.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.605
SUBAREA RUNOFF(CFS) = 0.59
TOTAL AREA(ACRES) = 0.40   TOTAL RUNOFF(CFS) = 0.59

```

```

*****
FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =   53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      625.00  DOWNSTREAM(FEET) =      430.00
CHANNEL LENGTH THRU SUBAREA(FEET) =      350.00  CHANNEL SLOPE =      0.5571
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =           0.59
FLOW VELOCITY(FEET/SEC) =      2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =      2.18  Tc(MIN.) =      7.95
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      12.00 =      450.00 FEET.

*****
FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      430.00  DOWNSTREAM(FEET) =      410.00
CHANNEL LENGTH THRU SUBAREA(FEET) =      300.00  CHANNEL SLOPE =      0.0667
CHANNEL BASE(FEET) =      0.00  "Z" FACTOR =      2.000
MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =      1.50
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =      2.753
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =      82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =           2.06
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =      6.16
AVERAGE FLOW DEPTH(FEET) =      0.41  TRAVEL TIME(MIN.) =      0.81
Tc(MIN.) =      8.76
SUBAREA AREA(ACRES) =           2.60  SUBAREA RUNOFF(CFS) =           2.93
AREA-AVERAGE RUNOFF COEFFICIENT =      0.410
TOTAL AREA(ACRES) =           3.00  PEAK FLOW RATE(CFS) =           3.39

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =      0.49  FLOW VELOCITY(FEET/SEC.) =      7.02
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =      750.00 FEET.

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =      2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =      8.76
RAINFALL INTENSITY(INCH/HR) =      2.75
TOTAL STREAM AREA(ACRES) =           3.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =           3.39

```

```

*****
FLOW PROCESS FROM NODE      14.00 TO NODE      15.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
UPSTREAM ELEVATION(FEET) = 430.00
DOWNSTREAM ELEVATION(FEET) = 429.00
ELEVATION DIFFERENCE(FEET) = 1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.514
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.952
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.18
TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.18
*****

FLOW PROCESS FROM NODE      15.00 TO NODE      13.00 IS CODE = 61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 429.00 DOWNSTREAM ELEVATION(FEET) = 410.00
STREET LENGTH(FEET) = 235.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 26.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 21.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.71
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.19
HALFSTREET FLOOD WIDTH(FEET) = 2.98
AVERAGE FLOW VELOCITY(FT/SEC.) = 3.43
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.64
STREET FLOW TRAVEL TIME(MIN.) = 1.14 Tc(MIN.) = 3.65
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.952
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.07
TOTAL AREA(ACRES) = 0.35 PEAK FLOW RATE(CFS) = 1.24

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.22 HALFSTREET FLOOD WIDTH(FEET) = 4.80
FLOW VELOCITY(FT/SEC.) = 3.57 DEPTH*VELOCITY(FT*FT/SEC.) = 0.79
LONGEST FLOWPATH FROM NODE 14.00 TO NODE 13.00 = 300.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =   1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   3.65
RAINFALL INTENSITY(INCH/HR) =   3.95
TOTAL STREAM AREA(ACRES) =       0.35
PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.24

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)  (ACRE)
    1         3.39       8.76       2.753        3.00
    2         1.24       3.65       3.952        0.35

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)
    1         2.66       3.65       3.952
    2         4.25       8.76       2.753

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       4.25   Tc(MIN.) =       8.76
TOTAL AREA(ACRES) =       3.35
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =   750.00 FEET.
*****
FLOW PROCESS FROM NODE      13.00 TO NODE      16.00 IS CODE =   51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   407.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   140.00  CHANNEL SLOPE =   0.0214
CHANNEL BASE(FEET) =   10.00  "Z" FACTOR =   3.000
MANNING'S FACTOR = 0.200  MAXIMUM DEPTH(FEET) =   1.50
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =   2.215
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =   82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.29
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.66
AVERAGE FLOW DEPTH(FEET) =   0.55  TRAVEL TIME(MIN.) =   3.51
Tc(MIN.) =   12.27
SUBAREA AREA(ACRES) =       0.07  SUBAREA RUNOFF(CFS) =       0.08
AREA-AVERAGE RUNOFF COEFFICIENT =   0.462
TOTAL AREA(ACRES) =       3.42  PEAK FLOW RATE(CFS) =       4.25

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =   0.55  FLOW VELOCITY(FEET/SEC.) =   0.66
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      16.00 =   890.00 FEET.

```

```
*****
FLOW PROCESS FROM NODE      16.00 TO NODE      4.00 IS CODE = 41
-----
```

```
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
```

```
ELEVATION DATA: UPSTREAM(FEET) = 402.50 DOWNSTREAM(FEET) = 401.80
FLOW LENGTH(FEET) = 65.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.68
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.25
PIPE TRAVEL TIME(MIN.) = 0.19 Tc(MIN.) = 12.46
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 4.00 = 955.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE = 11
-----
```

```
>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<
=====
```

\*\* MAIN STREAM CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	4.25	12.46	2.193	3.42

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 4.00 = 955.00 FEET.

\*\* MEMORY BANK # 1 CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	13.79	17.19	1.782	18.20

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1895.00 FEET.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	14.25	12.46	2.193
2	17.25	17.19	1.782

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 17.25 Tc(MIN.) = 17.19  
TOTAL AREA(ACRES) = 21.62

```
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      17.00 IS CODE = 41
-----
```

```
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
```

```
ELEVATION DATA: UPSTREAM(FEET) = 401.80 DOWNSTREAM(FEET) = 397.50
FLOW LENGTH(FEET) = 22.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 6.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 23.39
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 17.25
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 17.21
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 17.00 = 1917.00 FEET.
```

```

*****
FLOW PROCESS FROM NODE      17.00 TO NODE      17.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.21
RAINFALL INTENSITY(INCH/HR) = 1.78
TOTAL STREAM AREA(ACRES) = 21.62
PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.25

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =    21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 675.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 50.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.605
SUBAREA RUNOFF(CFS) = 0.30
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.30

*****
FLOW PROCESS FROM NODE      19.00 TO NODE      20.00 IS CODE =    53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 408.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00 CHANNEL SLOPE = 0.3945
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2130 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.30
FLOW VELOCITY(FEET/SEC) = 2.58 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.55 Tc(MIN.) = 9.31
LONGEST FLOWPATH FROM NODE      18.00 TO NODE      20.00 = 650.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      20.00 TO NODE      17.00 IS CODE =  61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) =  408.00  DOWNSTREAM ELEVATION(FEET) =  405.90
STREET LENGTH(FEET) =    250.00    CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =    30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =    25.00
INSIDE STREET CROSSFALL(DECIMAL) =    0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =    0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =    1
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =    0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =          1.08
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) =    0.29
HALFSTREET FLOOD WIDTH(FEET) =          8.10
AVERAGE FLOW VELOCITY(FEET/SEC.) =          1.39
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =          0.40
STREET FLOW TRAVEL TIME(MIN.) =    3.00    Tc(MIN.) =   12.31
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.210
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =    82
AREA-AVERAGE RUNOFF COEFFICIENT =    0.410
SUBAREA AREA(ACRES) =    1.70    SUBAREA RUNOFF(CFS) =    1.54
TOTAL AREA(ACRES) =    1.90    PEAK FLOW RATE(CFS) =          1.72

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.33    HALFSTREET FLOOD WIDTH(FEET) =    9.99
FLOW VELOCITY(FEET/SEC.) = 1.54    DEPTH*VELOCITY(FT*FT/SEC.) =    0.50
LONGEST FLOWPATH FROM NODE    18.00 TO NODE    17.00 =    900.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      17.00 TO NODE      17.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =    3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   12.31
RAINFALL INTENSITY(INCH/HR) =    2.21
TOTAL STREAM AREA(ACRES) =    1.90
PEAK FLOW RATE(CFS) AT CONFLUENCE =          1.72

```



\*\*\*\*\*  
FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00  
UPSTREAM ELEVATION(FEET) = 641.00  
DOWNSTREAM ELEVATION(FEET) = 625.00  
ELEVATION DIFFERENCE(FEET) = 16.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.648  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.952  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
SUBAREA RUNOFF(CFS) = 0.32  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 53  
-----

>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 410.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00 CHANNEL SLOPE = 0.4300  
SLOPE ADJUSTMENT CURVE USED:  
EFFECTIVE SLOPE = .2176 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION  
CHANNEL FLOW THRU SUBAREA(CFS) = 0.32  
FLOW VELOCITY(FEET/SEC) = 2.61 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 3.19 Tc(MIN.) = 7.84  
LONGEST FLOWPATH FROM NODE 21.00 TO NODE 23.00 = 565.00 FEET.

```

*****
FLOW PROCESS FROM NODE      23.00 TO NODE      17.00 IS CODE =  61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) =  410.00  DOWNSTREAM ELEVATION(FEET) =  405.90
STREET LENGTH(FEET) =    500.00    CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =    30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   25.00
INSIDE STREET CROSSFALL(DECIMAL) =    0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =    0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =    1
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =    0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =          1.28
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) =    0.30
HALFSTREET FLOOD WIDTH(FEET) =    8.82
AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.43
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.43
STREET FLOW TRAVEL TIME(MIN.) =    5.81  Tc(MIN.) =   13.65
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.068
USER-SPECIFIED RUNOFF COEFFICIENT =    .4100
S.C.S. CURVE NUMBER (AMC II) =    82
AREA-AVERAGE RUNOFF COEFFICIENT =    0.410
SUBAREA AREA(ACRES) =    2.20    SUBAREA RUNOFF(CFS) =    1.87
TOTAL AREA(ACRES) =    2.40    PEAK FLOW RATE(CFS) =    2.03

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) =  0.34  HALFSTREET FLOOD WIDTH(FEET) =   10.77
FLOW VELOCITY(FEET/SEC.) =  1.59  DEPTH*VELOCITY(FT*FT/SEC.) =    0.54
LONGEST FLOWPATH FROM NODE    21.00 TO NODE    17.00 =  1065.00 FEET.

```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 1  
 -----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<  
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<  
 =====

TOTAL NUMBER OF STREAMS = 3  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:  
 TIME OF CONCENTRATION(MIN.) = 13.65  
 RAINFALL INTENSITY(INCH/HR) = 2.07  
 TOTAL STREAM AREA(ACRES) = 2.40  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.03

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	17.25	17.21	1.781	21.62
2	1.72	12.31	2.210	1.90
3	2.03	13.65	2.068	2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 3 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	15.90	12.31	2.210
2	17.33	13.65	2.068
3	20.39	17.21	1.781

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 20.39 Tc(MIN.) = 17.21  
 TOTAL AREA(ACRES) = 25.92  
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 17.00 = 1917.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 17.00 TO NODE 24.00 IS CODE = 41  
 -----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<  
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<  
 =====

ELEVATION DATA: UPSTREAM(FEET) = 397.50 DOWNSTREAM(FEET) = 393.50  
 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 12.5 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.37  
 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 20.39  
 PIPE TRAVEL TIME(MIN.) = 0.18 Tc(MIN.) = 17.39  
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 24.00 = 2050.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 41

-----  
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	393.50	DOWNSTREAM(FEET) =	387.50
FLOW LENGTH(FEET) =	64.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS	9.0 INCHES		
PIPE-FLOW VELOCITY(FEET/SEC.) =	18.82		
GIVEN PIPE DIAMETER(INCH) =	24.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	20.39		
PIPE TRAVEL TIME(MIN.) =	0.06	Tc(MIN.) =	17.44
LONGEST FLOWPATH FROM NODE	1.00 TO NODE	25.00 =	2114.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	25.92	TC(MIN.) =	17.44
PEAK FLOW RATE(CFS)	=	20.39		

=====

=====

END OF RATIONAL METHOD ANALYSIS



\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by:

10 YEAR DEVELOPED

-----  
FILE NAME: LK0382.DAT  
TIME/DATE OF STUDY: 14:44 11/14/2007  
-----

-----  
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
-----

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 10.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 1.800  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*  
FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 770.00  
DOWNSTREAM ELEVATION(FEET) = 735.00  
ELEVATION DIFFERENCE(FEET) = 35.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.326  
SUBAREA RUNOFF(CFS) = 0.35  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.35

```

*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =   53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    735.00  DOWNSTREAM(FEET) =    430.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1500.00  CHANNEL SLOPE =   0.2033
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1617 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =         0.35
FLOW VELOCITY(FEET/SEC) =    2.25 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   11.10  Tc(MIN.) =   16.87
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  1600.00 FEET.

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =   2.165
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =   82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4100
SUBAREA AREA(ACRES) =   16.00  SUBAREA RUNOFF(CFS) =   14.20
TOTAL AREA(ACRES) =   16.20  TOTAL RUNOFF(CFS) =   14.38
TC(MIN.) =   16.87

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =   41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   425.00  DOWNSTREAM(FEET) =   401.80
FLOW LENGTH(FEET) =   295.00  MANNING'S N =   0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =   18.31
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) =   12.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =   14.38
PIPE TRAVEL TIME(MIN.) =    0.27  Tc(MIN.) =   17.14
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  1895.00 FEET.

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS =    3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =   17.14
RAINFALL INTENSITY(INCH/HR) =    2.14
TOTAL STREAM AREA(ACRES) =   16.20
PEAK FLOW RATE(CFS) AT CONFLUENCE =   14.38

```



\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 675.00  
DOWNSTREAM ELEVATION(FEET) = 625.00  
ELEVATION DIFFERENCE(FEET) = 50.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.326  
SUBAREA RUNOFF(CFS) = 0.35  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.35

\*\*\*\*\*  
FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 53  
-----

>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 430.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.5571  
SLOPE ADJUSTMENT CURVE USED:  
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION  
CHANNEL FLOW THRU SUBAREA(CFS) = 0.35  
FLOW VELOCITY(FEET/SEC) = 2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 7.95  
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 7.00 = 450.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 7.00 TO NODE 4.00 IS CODE = 51  
-----

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 430.00 DOWNSTREAM(FEET) = 408.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 290.00 CHANNEL SLOPE = 0.0759  
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 2.000  
MANNING'S FACTOR = 0.020 MAXIMUM DEPTH(FEET) = 1.50  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.294  
USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.30  
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.69  
AVERAGE FLOW DEPTH(FEET) = 0.34 TRAVEL TIME(MIN.) = 0.85  
Tc(MIN.) = 8.80  
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 1.89  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 2.16

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.41 FLOW VELOCITY(FEET/SEC.) = 6.52  
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 4.00 = 740.00 FEET.

```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   8.80
RAINFALL INTENSITY(INCH/HR) =   3.29
TOTAL STREAM AREA(ACRES) =    1.60
PEAK FLOW RATE(CFS) AT CONFLUENCE =          2.16

*****
FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) =  82
INITIAL SUBAREA FLOW-LENGTH(FEET) =   65.00
UPSTREAM ELEVATION(FEET) =   430.00
DOWNSTREAM ELEVATION(FEET) =   429.00
ELEVATION DIFFERENCE(FEET) =    1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.514
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =   4.743
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) =    0.17
TOTAL AREA(ACRES) =    0.04  TOTAL RUNOFF(CFS) =    0.17

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 4.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION(FEET)	=	429.00	DOWNSTREAM ELEVATION(FEET)	=	408.00
STREET LENGTH(FEET)	=	230.00	CURB HEIGHT(INCHES)	=	6.0
STREET HALFWIDTH(FEET)	=	26.00			

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET)	=	21.00
INSIDE STREET CROSSFALL(DECIMAL)	=	0.020
OUTSIDE STREET CROSSFALL(DECIMAL)	=	0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.94  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.20  
HALFSTREET FLOOD WIDTH(FEET) = 3.75  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.63  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.73  
STREET FLOW TRAVEL TIME(MIN.) = 1.06 Tc(MIN.) = 3.57  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
\*USER SPECIFIED(SUBAREA):  
USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900  
SUBAREA AREA(ACRES) = 0.36 SUBAREA RUNOFF(CFS) = 1.54  
TOTAL AREA(ACRES) = 0.40 PEAK FLOW RATE(CFS) = 1.71

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.24 HALFSTREET FLOOD WIDTH(FEET) = 5.57  
FLOW VELOCITY(FEET/SEC.) = 3.99 DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.95  
LONGEST FLOWPATH FROM NODE 8.00 TO NODE 4.00 = 295.00 FEET.

```
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
```

```
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
```

```
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION(MIN.) = 3.57
RAINFALL INTENSITY(INCH/HR) = 4.74
TOTAL STREAM AREA(ACRES) = 0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.71
```

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	14.38	17.14	2.143	16.20
2	2.16	8.80	3.294	1.60
3	1.71	3.57	4.743	0.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 3 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	5.58	3.57	4.743
2	10.73	8.80	3.294
3	16.55	17.14	2.143

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) = 16.55 Tc(MIN.) = 17.14
TOTAL AREA(ACRES) = 18.20
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 = 1895.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  10
-----
```

```
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====
```

```
*****
FLOW PROCESS FROM NODE      10.00 TO NODE      11.00 IS CODE =  21
-----
```

```
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
```

```
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 641.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 16.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.326
SUBAREA RUNOFF(CFS) = 0.71
TOTAL AREA(ACRES) = 0.40 TOTAL RUNOFF(CFS) = 0.71
```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 53  
-----

>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	625.00	DOWNSTREAM(FEET) =	430.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	350.00	CHANNEL SLOPE =	0.5571

SLOPE ADJUSTMENT CURVE USED:  
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION  
CHANNEL FLOW THRU SUBAREA(CFS) = 0.71  
FLOW VELOCITY(FEET/SEC) = 2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 7.95  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 450.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 51  
-----

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	430.00	DOWNSTREAM(FEET) =	410.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	300.00	CHANNEL SLOPE =	0.0667
CHANNEL BASE(FEET) =	0.00	"Z" FACTOR =	2.000

MANNING'S FACTOR = 0.020 MAXIMUM DEPTH(FEET) = 1.50  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.313  
USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.48  
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.47  
AVERAGE FLOW DEPTH(FEET) = 0.44 TRAVEL TIME(MIN.) = 0.77  
Tc(MIN.) = 8.72  
SUBAREA AREA(ACRES) = 2.60 SUBAREA RUNOFF(CFS) = 3.53  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
TOTAL AREA(ACRES) = 3.00 PEAK FLOW RATE(CFS) = 4.07

END OF SUBAREA CHANNEL FLOW HYDRAULICS:  
DEPTH(FEET) = 0.53 FLOW VELOCITY(FEET/SEC.) = 7.27  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 13.00 = 750.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 1  
-----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MIN.) = 8.72  
RAINFALL INTENSITY(INCH/HR) = 3.31  
TOTAL STREAM AREA(ACRES) = 3.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.07

\*\*\*\*\*  
FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

\*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00  
UPSTREAM ELEVATION(FEET) = 430.00  
DOWNSTREAM ELEVATION(FEET) = 429.00  
ELEVATION DIFFERENCE(FEET) = 1.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.514  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
SUBAREA RUNOFF(CFS) = 0.21  
TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 13.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 429.00 DOWNSTREAM ELEVATION(FEET) = 410.00  
STREET LENGTH(FEET) = 235.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 26.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 21.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.85  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.20  
HALFSTREET FLOOD WIDTH(FEET) = 3.65  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.39  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.68  
STREET FLOW TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 3.67  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.

\*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900  
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.28  
TOTAL AREA(ACRES) = 0.35 PEAK FLOW RATE(CFS) = 1.49

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.23 HALFSTREET FLOOD WIDTH(FEET) = 5.38  
FLOW VELOCITY(FEET/SEC.) = 3.67 DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.86  
LONGEST FLOWPATH FROM NODE 14.00 TO NODE 13.00 = 300.00 FEET.

```

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =   1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   3.67
RAINFALL INTENSITY(INCH/HR) =   4.74
TOTAL STREAM AREA(ACRES) =     0.35
PEAK FLOW RATE(CFS) AT CONFLUENCE =           1.49

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
    1         4.07       8.72       3.313         3.00
    2         1.49       3.67       4.743         0.35

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)
    1         3.21       3.67       4.743
    2         5.12       8.72       3.313

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       5.12   Tc(MIN.) =       8.72
TOTAL AREA(ACRES) =       3.35
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =   750.00 FEET.
*****
FLOW PROCESS FROM NODE      13.00 TO NODE      16.00 IS CODE =   51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM( FEET) =   410.00  DOWNSTREAM( FEET) =   407.00
CHANNEL LENGTH THRU SUBAREA( FEET) =   140.00  CHANNEL SLOPE =   0.0214
CHANNEL BASE( FEET) =   10.00  "Z" FACTOR =   3.000
MANNING'S FACTOR = 0.200  MAXIMUM DEPTH( FEET) =   1.50
  10 YEAR RAINFALL INTENSITY(INCH/ HOUR) =   2.695
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =  82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.17
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY( FEET/ SEC.) =   0.71
AVERAGE FLOW DEPTH( FEET) =   0.62  TRAVEL TIME(MIN.) =   3.29
Tc(MIN.) =  12.01
SUBAREA AREA(ACRES) =       0.07  SUBAREA RUNOFF(CFS) =       0.09
AREA-AVERAGE RUNOFF COEFFICIENT =   0.462
TOTAL AREA(ACRES) =       3.42  PEAK FLOW RATE(CFS) =       5.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH( FEET) =   0.61  FLOW VELOCITY( FEET/ SEC.) =   0.71
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      16.00 =   890.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      16.00 TO NODE      4.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  402.50  DOWNSTREAM(FEET) =  401.80
FLOW LENGTH(FEET) =  65.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  8.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  5.96
GIVEN PIPE DIAMETER(INCH) =  18.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =  5.12
PIPE TRAVEL TIME(MIN.) =  0.18  Tc(MIN.) =  12.19
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      4.00 =  955.00 FEET.

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
-----
>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)      (ACRE)
  1          5.12      12.19          2.669          3.42
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      4.00 =  955.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)      (ACRE)
  1         16.55      17.14          2.143          18.20
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  1895.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)
  1         16.90      12.19          2.669
  2         20.66      17.14          2.143

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =  20.66  Tc(MIN.) =  17.14
TOTAL AREA(ACRES) =  21.62

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      17.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  401.80  DOWNSTREAM(FEET) =  397.50
FLOW LENGTH(FEET) =  22.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  7.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  24.62
GIVEN PIPE DIAMETER(INCH) =  24.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =  20.66
PIPE TRAVEL TIME(MIN.) =  0.01  Tc(MIN.) =  17.15
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      17.00 =  1917.00 FEET.

```



```

*****
FLOW PROCESS FROM NODE      17.00 TO NODE      17.00 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.15
RAINFALL INTENSITY(INCH/HR) = 2.14
TOTAL STREAM AREA(ACRES) = 21.62
PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.66

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =    21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 675.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 50.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.326
SUBAREA RUNOFF(CFS) = 0.35
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.35

*****
FLOW PROCESS FROM NODE      19.00 TO NODE      20.00 IS CODE =    53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 408.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00 CHANNEL SLOPE = 0.3945
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2130 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.35
FLOW VELOCITY(FEET/SEC) = 2.58 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.55 Tc(MIN.) = 9.31
LONGEST FLOWPATH FROM NODE      18.00 TO NODE      20.00 = 650.00 FEET.

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 17.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<<  
=====

UPSTREAM ELEVATION(FEET) = 408.00 DOWNSTREAM ELEVATION(FEET) = 405.90  
STREET LENGTH(FEET) = 250.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 25.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.30  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.30  
HALFSTREET FLOOD WIDTH(FEET) = 8.82  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.45  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.44  
STREET FLOW TRAVEL TIME(MIN.) = 2.88 Tc(MIN.) = 12.19  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.669  
USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
SUBAREA AREA(ACRES) = 1.70 SUBAREA RUNOFF(CFS) = 1.86  
TOTAL AREA(ACRES) = 1.90 PEAK FLOW RATE(CFS) = 2.08

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 10.82  
FLOW VELOCITY(FEET/SEC.) = 1.61 DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.55  
LONGEST FLOWPATH FROM NODE 18.00 TO NODE 17.00 = 900.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 1  
-----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<  
=====

TOTAL NUMBER OF STREAMS = 3  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MIN.) = 12.19  
RAINFALL INTENSITY(INCH/HR) = 2.67  
TOTAL STREAM AREA(ACRES) = 1.90  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.08

```

*****
FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
UPSTREAM ELEVATION(FEET) = 641.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 16.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.648
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.39
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.39

*****
FLOW PROCESS FROM NODE      22.00 TO NODE      23.00 IS CODE =  53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 410.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00 CHANNEL SLOPE = 0.4300
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2176 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.39
FLOW VELOCITY(FEET/SEC) = 2.61 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.19 Tc(MIN.) = 7.84
LONGEST FLOWPATH FROM NODE      21.00 TO NODE      23.00 = 565.00 FEET.

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 23.00 TO NODE 17.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION(FEET) =	410.00	DOWNSTREAM ELEVATION(FEET) =	405.90
STREET LENGTH(FEET) =	500.00	CURB HEIGHT(INCHES) =	6.0
STREET HALFWIDTH(FEET) =	30.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =	25.00
INSIDE STREET CROSSFALL(DECIMAL) =	0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =	0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =	1.55		
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:			
STREET FLOW DEPTH(FEET) =	0.32		
HALFSTREET FLOOD WIDTH(FEET) =	9.60		
AVERAGE FLOW VELOCITY(FEET/SEC.) =	1.49		
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =	0.48		
STREET FLOW TRAVEL TIME(MIN.) =	5.58	Tc(MIN.) =	13.42
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.509		
USER-SPECIFIED RUNOFF COEFFICIENT =	.4100		
S.C.S. CURVE NUMBER (AMC II) =	82		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.410		
SUBAREA AREA(ACRES) =	2.20	SUBAREA RUNOFF(CFS) =	2.26
TOTAL AREA(ACRES) =	2.40	PEAK FLOW RATE(CFS) =	2.47

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) =	0.36	HALFSTREET FLOOD WIDTH(FEET) =	11.71
FLOW VELOCITY(FEET/SEC.) =	1.66	DEPTH*VELOCITY(FT*FT/SEC.) =	0.60
LONGEST FLOWPATH FROM NODE	21.00	TO NODE	17.00 = 1065.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 1  
 -----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<  
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<  
 =====

TOTAL NUMBER OF STREAMS = 3  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:  
 TIME OF CONCENTRATION(MIN.) = 13.42  
 RAINFALL INTENSITY(INCH/HR) = 2.51  
 TOTAL STREAM AREA(ACRES) = 2.40  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.47

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	20.66	17.15	2.141	21.62
2	2.08	12.19	2.669	1.90
3	2.47	13.42	2.509	2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 3 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	19.01	12.19	2.669
2	20.59	13.42	2.509
3	24.44	17.15	2.141

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 24.44 Tc(MIN.) = 17.15  
 TOTAL AREA(ACRES) = 25.92  
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 17.00 = 1917.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 17.00 TO NODE 24.00 IS CODE = 41  
 -----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<  
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<  
 =====

ELEVATION DATA: UPSTREAM(FEET) = 397.50 DOWNSTREAM(FEET) = 393.50  
 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 13.9 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.91  
 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 24.44  
 PIPE TRAVEL TIME(MIN.) = 0.17 Tc(MIN.) = 17.32  
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 24.00 = 2050.00 FEET.

```

*****
FLOW PROCESS FROM NODE      24.00 TO NODE      25.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   393.50  DOWNSTREAM(FEET) =   387.50
FLOW LENGTH(FEET) =    64.00  MANNING'S N =   0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  10.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   19.76
GIVEN PIPE DIAMETER(INCH) =   24.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    24.44
PIPE TRAVEL TIME(MIN.) =    0.05  Tc(MIN.) =   17.38
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      25.00 =  2114.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    25.92  TC(MIN.) =    17.38
PEAK FLOW RATE(CFS)    =    24.44
=====
END OF RATIONAL METHOD ANALYSIS

```



\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL

(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by:

100 YEAR DEVELOPED

-----  
FILE NAME: LK0382.DAT  
TIME/DATE OF STUDY: 14:51 11/14/2007  
-----

-----  
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
-----

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS  
\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*  
FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 770.00  
DOWNSTREAM ELEVATION(FEET) = 735.00  
ELEVATION DIFFERENCE(FEET) = 35.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.489  
SUBAREA RUNOFF(CFS) = 0.53  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.53



\*\*\*\*\*  
FLOW PROCESS FROM NODE            2.00 TO NODE            3.00 IS CODE = 53  
-----

>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	735.00	DOWNSTREAM(FEET) =	430.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1500.00	CHANNEL SLOPE =	0.2033
SLOPE ADJUSTMENT CURVE USED:			
EFFECTIVE SLOPE =	.1617	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION			
CHANNEL FLOW THRU SUBAREA(CFS) =	0.53		
FLOW VELOCITY(FEET/SEC) =	2.25	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME(MIN.) =	11.10	Tc(MIN.) =	16.87
LONGEST FLOWPATH FROM NODE	1.00 TO NODE	3.00 =	1600.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE            3.00 TO NODE            3.00 IS CODE = 81  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.247		
USER-SPECIFIED RUNOFF COEFFICIENT =	.4100		
S.C.S. CURVE NUMBER (AMC II) =	82		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.4100		
SUBAREA AREA(ACRES) =	16.00	SUBAREA RUNOFF(CFS) =	21.30
TOTAL AREA(ACRES) =	16.20	TOTAL RUNOFF(CFS) =	21.57
TC(MIN.) =	16.87		

\*\*\*\*\*  
FLOW PROCESS FROM NODE            3.00 TO NODE            4.00 IS CODE = 41  
-----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	425.00	DOWNSTREAM(FEET) =	401.80
FLOW LENGTH(FEET) =	295.00	MANNING'S N =	0.013
ASSUME FULL-FLOWING PIPELINE			
PIPE-FLOW VELOCITY(FEET/SEC.) =	27.46		
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)			
GIVEN PIPE DIAMETER(INCH) =	12.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	21.57		
PIPE TRAVEL TIME(MIN.) =	0.18	Tc(MIN.) =	17.05
LONGEST FLOWPATH FROM NODE	1.00 TO NODE	4.00 =	1895.00 FEET.

```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.05
RAINFALL INTENSITY(INCH/HR) = 3.22
TOTAL STREAM AREA(ACRES) = 16.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 21.57

*****
FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 675.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 50.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.489
SUBAREA RUNOFF(CFS) = 0.53
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.53

*****
FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 430.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.5571
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.53
FLOW VELOCITY(FEET/SEC) = 2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 7.95
LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 = 450.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      7.00 TO NODE      4.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 430.00 DOWNSTREAM(FEET) = 408.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 290.00 CHANNEL SLOPE = 0.0759
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.020 MAXIMUM DEPTH(FEET) = 1.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.975
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.96
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.39
AVERAGE FLOW DEPTH(FEET) = 0.39 TRAVEL TIME(MIN.) = 0.76
Tc(MIN.) = 8.70
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 2.86
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 3.26

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.48 FLOW VELOCITY(FEET/SEC.) = 7.21
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 4.00 = 740.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 8.70
RAINFALL INTENSITY(INCH/HR) = 4.98
TOTAL STREAM AREA(ACRES) = 1.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.26

```

```

*****
FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
UPSTREAM ELEVATION(FEET) = 430.00
DOWNSTREAM ELEVATION(FEET) = 429.00
ELEVATION DIFFERENCE(FEET) = 1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.514
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.26
TOTAL AREA(ACRES) = 0.04 TOTAL RUNOFF(CFS) = 0.26

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 4.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<  
=====

UPSTREAM ELEVATION(FEET) = 429.00 DOWNSTREAM ELEVATION(FEET) = 408.00  
STREET LENGTH(FEET) = 230.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 26.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 21.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.41  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.23  
HALFSTREET FLOOD WIDTH(FEET) = 4.99  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.83  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.87  
STREET FLOW TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 3.51  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
\*USER SPECIFIED(SUBAREA):  
USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900  
SUBAREA AREA(ACRES) = 0.36 SUBAREA RUNOFF(CFS) = 2.30  
TOTAL AREA(ACRES) = 0.40 PEAK FLOW RATE(CFS) = 2.56

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.26 HALFSTREET FLOOD WIDTH(FEET) = 6.91  
FLOW VELOCITY(FEET/SEC.) = 4.30 DEPTH\*VELOCITY(FT\*FT/SEC.) = 1.14  
LONGEST FLOWPATH FROM NODE 8.00 TO NODE 4.00 = 295.00 FEET.

```
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
-----
```

```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
```

```
TOTAL NUMBER OF STREAMS =   3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM   3 ARE:
TIME OF CONCENTRATION(MIN.) =   3.51
RAINFALL INTENSITY(INCH/HR) =   7.11
TOTAL STREAM AREA(ACRES) =   0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE =           2.56
```

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	21.57	17.05	3.225	16.20
2	3.26	8.70	4.975	1.60
3	2.56	3.51	7.114	0.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 3 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	8.32	3.51	7.114
2	16.07	8.70	4.975
3	24.84	17.05	3.225

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) =   24.84   Tc(MIN.) =   17.05
TOTAL AREA(ACRES) =   18.20
```

```
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 = 1895.00 FEET.
```

```
*****
```

```
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  10
-----
```

```
>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<
=====
```

```
*****
```

```
FLOW PROCESS FROM NODE      10.00 TO NODE      11.00 IS CODE =  21
-----
```

```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
```

```
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(Feet) = 100.00
UPSTREAM ELEVATION(Feet) = 641.00
DOWNSTREAM ELEVATION(Feet) = 625.00
ELEVATION DIFFERENCE(Feet) = 16.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.489
SUBAREA RUNOFF(CFS) = 1.06
TOTAL AREA(ACRES) = 0.40   TOTAL RUNOFF(CFS) = 1.06
```

```

*****
FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =   53
-----
>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      625.00  DOWNSTREAM(FEET) =      430.00
CHANNEL LENGTH THRU SUBAREA(FEET) =      350.00  CHANNEL SLOPE =      0.5571
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2279 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
CHANNEL FLOW THRU SUBAREA(CFS) =          1.06
FLOW VELOCITY(FEET/SEC) =      2.73 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =      2.14  Tc(MIN.) =      7.90
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      12.00 =      450.00 FEET.

*****
FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      430.00  DOWNSTREAM(FEET) =      410.00
CHANNEL LENGTH THRU SUBAREA(FEET) =      300.00  CHANNEL SLOPE =      0.0667
CHANNEL BASE(FEET) =      0.00  "Z" FACTOR =      2.000
MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =      1.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =      5.017
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) =      82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =          3.74
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =      7.25
AVERAGE FLOW DEPTH(FEET) =      0.51  TRAVEL TIME(MIN.) =      0.69
Tc(MIN.) =      8.59
SUBAREA AREA(ACRES) =      2.60  SUBAREA RUNOFF(CFS) =      5.35
AREA-AVERAGE RUNOFF COEFFICIENT =      0.410
TOTAL AREA(ACRES) =      3.00  PEAK FLOW RATE(CFS) =          6.17

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =      0.62  FLOW VELOCITY(FEET/SEC.) =      8.15
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =      750.00 FEET.

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =      2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =      8.59
RAINFALL INTENSITY(INCH/HR) =      5.02
TOTAL STREAM AREA(ACRES) =      3.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =          6.17

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

\*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00  
UPSTREAM ELEVATION(FEET) = 430.00  
DOWNSTREAM ELEVATION(FEET) = 429.00  
ELEVATION DIFFERENCE(FEET) = 1.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.514  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
SUBAREA RUNOFF(CFS) = 0.32  
TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 13.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STANDARD CURB SECTION USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 429.00 DOWNSTREAM ELEVATION(FEET) = 410.00  
STREET LENGTH(FEET) = 235.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 26.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 21.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.28  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.22  
HALFSTREET FLOOD WIDTH(FEET) = 4.90  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.58  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.80  
STREET FLOW TRAVEL TIME(MIN.) = 1.09 Tc(MIN.) = 3.61  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
\*USER SPECIFIED(SUBAREA):  
USER-SPECIFIED RUNOFF COEFFICIENT = .9000  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.900  
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.92  
TOTAL AREA(ACRES) = 0.35 PEAK FLOW RATE(CFS) = 2.24

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.26 HALFSTREET FLOOD WIDTH(FEET) = 6.72  
FLOW VELOCITY(FEET/SEC.) = 3.94 DEPTH\*VELOCITY(FT\*FT/SEC.) = 1.03  
LONGEST FLOWPATH FROM NODE 14.00 TO NODE 13.00 = 300.00 FEET.

```

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   3.61
RAINFALL INTENSITY(INCH/HR) =   7.11
TOTAL STREAM AREA(ACRES) =    0.35
PEAK FLOW RATE(CFS) AT CONFLUENCE =          2.24

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/HR)      (ACRE)
    1         6.17        8.59        5.017         3.00
    2         2.24        3.61        7.114         0.35

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/HR)
    1         4.83        3.61        7.114
    2         7.75        8.59        5.017

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =   7.75   Tc(MIN.) =   8.59
TOTAL AREA(ACRES) =   3.35
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =   750.00 FEET.
*****
FLOW PROCESS FROM NODE      13.00 TO NODE      16.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   407.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   140.00  CHANNEL SLOPE =   0.0214
CHANNEL BASE(FEET) =   10.00  "Z" FACTOR =   3.000
MANNING'S FACTOR = 0.200  MAXIMUM DEPTH(FEET) =   1.50
  100 YEAR RAINFALL INTENSITY(INCH/HR) =   4.165
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =  82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =   7.82
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.81
AVERAGE FLOW DEPTH(FEET) =   0.78  TRAVEL TIME(MIN.) =   2.88
Tc(MIN.) =  11.47
SUBAREA AREA(ACRES) =   0.07  SUBAREA RUNOFF(CFS) =   0.15
AREA-AVERAGE RUNOFF COEFFICIENT =  0.462
TOTAL AREA(ACRES) =   3.42  PEAK FLOW RATE(CFS) =   7.75

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.78  FLOW VELOCITY(FEET/SEC.) =   0.81
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      16.00 =   890.00 FEET.

```



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*****
FLOW PROCESS FROM NODE      16.00 TO NODE      4.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  402.50  DOWNSTREAM(FEET) =  401.80
FLOW LENGTH(FEET) =  65.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  6.56
GIVEN PIPE DIAMETER(INCH) =  18.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =  7.75
PIPE TRAVEL TIME(MIN.) =  0.17  Tc(MIN.) =  11.63
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      4.00 =  955.00 FEET.

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
-----
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)      (ACRE)
  1          7.75      11.63          4.126          3.42
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      4.00 =  955.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)      (ACRE)
  1         24.84      17.05          3.225          18.20
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  1895.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)
  1         24.70      11.63          4.126
  2         30.90      17.05          3.225

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =  30.90  Tc(MIN.) =  17.05
TOTAL AREA(ACRES) =  21.62
*****
FLOW PROCESS FROM NODE      4.00 TO NODE      17.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  401.80  DOWNSTREAM(FEET) =  397.50
FLOW LENGTH(FEET) =  22.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  9.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  27.53
GIVEN PIPE DIAMETER(INCH) =  24.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =  30.90
PIPE TRAVEL TIME(MIN.) =  0.01  Tc(MIN.) =  17.06
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      17.00 =  1917.00 FEET.

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*****
FLOW PROCESS FROM NODE      17.00 TO NODE      17.00 IS CODE =   1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.06
RAINFALL INTENSITY(INCH/HR) = 3.22
TOTAL STREAM AREA(ACRES) = 21.62
PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.90

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
USER-SPECIFIED RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 675.00
DOWNSTREAM ELEVATION(FEET) = 625.00
ELEVATION DIFFERENCE(FEET) = 50.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.489
SUBAREA RUNOFF(CFS) = 0.53
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.53

*****
FLOW PROCESS FROM NODE      19.00 TO NODE      20.00 IS CODE =  53
-----
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 408.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00 CHANNEL SLOPE = 0.3945
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2130 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.53
FLOW VELOCITY(FEET/SEC) = 2.58 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.55 Tc(MIN.) = 9.31
LONGEST FLOWPATH FROM NODE      18.00 TO NODE      20.00 = 650.00 FEET.

```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 17.00 IS CODE = 61  
-----

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>>(STANDARD CURB SECTION USED)<<<<<  
=====

UPSTREAM ELEVATION(FEET) = 408.00 DOWNSTREAM ELEVATION(FEET) = 405.90  
STREET LENGTH(FEET) = 250.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 25.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.96  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.34  
HALFSTREET FLOOD WIDTH(FEET) = 10.55  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.60  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.54  
STREET FLOW TRAVEL TIME(MIN.) = 2.61 Tc(MIN.) = 11.92  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.062  
USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
SUBAREA AREA(ACRES) = 1.70 SUBAREA RUNOFF(CFS) = 2.83  
TOTAL AREA(ACRES) = 1.90 PEAK FLOW RATE(CFS) = 3.16

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.38 HALFSTREET FLOOD WIDTH(FEET) = 12.88  
FLOW VELOCITY(FEET/SEC.) = 1.78 DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.68  
LONGEST FLOWPATH FROM NODE 18.00 TO NODE 17.00 = 900.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 1  
-----

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<  
=====

TOTAL NUMBER OF STREAMS = 3  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MIN.) = 11.92  
RAINFALL INTENSITY(INCH/HR) = 4.06  
TOTAL STREAM AREA(ACRES) = 1.90  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 21

-----  
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
=====

USER-SPECIFIED RUNOFF COEFFICIENT = .4100  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00  
UPSTREAM ELEVATION(FEET) = 641.00  
DOWNSTREAM ELEVATION(FEET) = 625.00  
ELEVATION DIFFERENCE(FEET) = 16.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.648  
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114  
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.  
SUBAREA RUNOFF(CFS) = 0.58  
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 0.58

\*\*\*\*\*  
FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 53

-----  
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

ELEVATION DATA: UPSTREAM(FEET) = 625.00 DOWNSTREAM(FEET) = 410.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00 CHANNEL SLOPE = 0.4300  
SLOPE ADJUSTMENT CURVE USED:  
EFFECTIVE SLOPE = .2176 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION  
CHANNEL FLOW THRU SUBAREA(CFS) = 0.58  
FLOW VELOCITY(FEET/SEC) = 2.61 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 3.19 Tc(MIN.) = 7.84  
LONGEST FLOWPATH FROM NODE 21.00 TO NODE 23.00 = 565.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 23.00 TO NODE 17.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION(FEET)	=	410.00	DOWNSTREAM ELEVATION(FEET)	=	405.90
STREET LENGTH(FEET)	=	500.00	CURB HEIGHT(INCHES)	=	6.0
STREET HALFWIDTH(FEET)	=	30.00			

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET)	=	25.00
INSIDE STREET CROSSFALL(DECIMAL)	=	0.020
OUTSIDE STREET CROSSFALL(DECIMAL)	=	0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS)	=	2.37			
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:					
STREET FLOW DEPTH(FEET)	=	0.36			
HALFSTREET FLOOD WIDTH(FEET)	=	11.49			
AVERAGE FLOW VELOCITY(FEET/SEC.)	=	1.65			
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.)	=	0.59			
STREET FLOW TRAVEL TIME(MIN.)	=	5.05	Tc(MIN.)	=	12.89
100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.862			
USER-SPECIFIED RUNOFF COEFFICIENT	=	.4100			
S.C.S. CURVE NUMBER (AMC II)	=	82			
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.410			
SUBAREA AREA(ACRES)	=	2.20	SUBAREA RUNOFF(CFS)	=	3.48
TOTAL AREA(ACRES)	=	2.40	PEAK FLOW RATE(CFS)	=	3.80

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET)	=	0.41	HALFSTREET FLOOD WIDTH(FEET)	=	13.94
FLOW VELOCITY(FEET/SEC.)	=	1.84	DEPTH*VELOCITY(FT*FT/SEC.)	=	0.75
LONGEST FLOWPATH FROM NODE 21.00 TO NODE 17.00	=	1065.00 FEET.			

\*\*\*\*\*  
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 1  
-----

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<  
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<  
=====

TOTAL NUMBER OF STREAMS = 3  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:  
TIME OF CONCENTRATION(MIN.) = 12.89  
RAINFALL INTENSITY(INCH/HR) = 3.86  
TOTAL STREAM AREA(ACRES) = 2.40  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.80

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	30.90	17.06	3.223	21.62
2	3.16	11.92	4.062	1.90
3	3.80	12.89	3.862	2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 3 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	28.27	11.92	4.062
2	30.16	12.89	3.862
3	36.58	17.06	3.223

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 36.58 Tc(MIN.) = 17.06  
TOTAL AREA(ACRES) = 25.92  
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 17.00 = 1917.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 17.00 TO NODE 24.00 IS CODE = 41  
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<  
=====

ELEVATION DATA: UPSTREAM(FEET) = 397.50 DOWNSTREAM(FEET) = 393.50  
FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013  
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.8 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.86  
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 36.58  
PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 17.22  
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 24.00 = 2050.00 FEET.

```

*****
FLOW PROCESS FROM NODE      24.00 TO NODE      25.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   393.50  DOWNSTREAM(FEET) =   387.50
FLOW LENGTH(FEET) =    64.00  MANNING'S N =   0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  12.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   21.92
GIVEN PIPE DIAMETER(INCH) =   24.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    36.58
PIPE TRAVEL TIME(MIN.) =    0.05  Tc(MIN.) =   17.27
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      25.00 =  2114.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    25.92  TC(MIN.) =    17.27
PEAK FLOW RATE(CFS)    =    36.58
=====
END OF RATIONAL METHOD ANALYSIS

```